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EPR Study of the Vanadium Ions in Mg2SiO4 Crystal

Gracheva I., Rodionov A., Silkin N., Yusupov R., Dudnikova V., Zharikov E., Tarasov V.
Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

Vanadium-doped forsterite crystal has been studied with X-band electron paramagnetic resonance (EPR) spectroscopy. The sample was grown by the Czochralski technique in an argon atmosphere with 2 vol% of hydrogen. The EPR spectrum of the sample at T = 15 K is predominantly represented by the V4+ ion signals that possess a characteristic eight-line hyperfine structure and are observed close to g = 2. The observation of the two magnetically nonequivalent centers in the angular dependence in the (ab) crystal plane and one center in the (ac) and (bc) planes, combined with the published optical spectroscopy data, unambiguously show that the V4+ ions are located at the silicon lattice site. Principal values of the hyperfine A and g-tensor and magnetic axes orientations of the V4+ centers have been determined. The orientation disorder of the V4+ centers has been found around the crystalline c axis but not in the (ab) crystal plane. The angular variation of the hyperfine component linewidth is described best with a disorder range of ±3. 0°. © 2012 Springer-Verlag Wien.

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